

THE
ADVICE

OF

W. P.

TO

Mr. *SAMUEL HARTLIB.*

FOR

The Advancement of some particu-
lar Parts of LEARNING.



LONDON, Printed *Anno Dom.* 1648.

There is invented an Instrument of small Bulke and price, easily made, and very durable, whereby any Man, even at the first sight and handling, may write two resembling Copies of the same thing at once, as serviceably and as fast (allowing two lines upon each page for setting the Instruments) as by the ordinary way. Of what Nature or in what Character, or what Matter soever, as Paper, Parchment, a Book, &c. the said writing ought to be upon made.

The Use hereof will be very great to Lawyers and Scriveners, for making of Indentures, and all kinde of Counter-parts, to Merchants, Intelligencers, Registers, Secretaries, Clerks; &c. for copying of Letters, Accompts, Invoices, Entering of Warrants, and other Records, To Scholars, for Transcribing of rare Manuscripts, and preserving Originals from falsification, and other injuries of time. It lesseneth the Labour of Examination, serveth to discover forgeries and surreptitious Copies, and to the transacting of all businesses of writing, as with ease and speed, so with much privacy also.



To his honoured friend Master
SAMUEL HARTLIB.

SIR,

I Have had many flying thoughts, concerning the Advancement of Reall Learning in generall, but particularly of the Education of Youth, Mathematicks, Mechanicks, Physick, and concerning the History of Art and Nature, with some more serious ones concerning your owne most excellent advices for an Office of Publick addressse. And indeed they were but flying thoughts, for seeing what vast summes were requisite to carry on those designs, and how unwilling or unable men generally were to contribute towards them, I thought it but labour lost to fix my mind much upon them.

But it having pleased God unexpectedly, to make me the Inventor of the Art of Double Writing, daily and hourly usefull to all sorts of Persons in all places of the world, and that to perpetuity, I conceived that if there were understanding enough in Men to be sensible of their own good, and Thankfulness or honesty enough to reward the Contrivers of it, such Meanes might be raised out of this Art as might at least set the aforementioned Designs on float, and make them ready to set saile toward the haven of perfection upon every opportunity of stronger gales. And thereupon I
reas-

The Epistle Dedicatory.

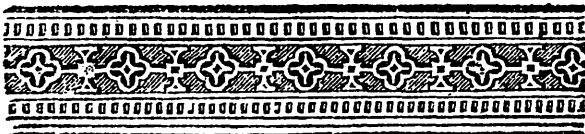
reassumed my Meditations, which I here give you, desiring you and your Ingenious Freinds to remeditate upon them and correct them, but withall to think of the best Course, how to improve my Invention to such advantage, as may if possible, make us capable of enjoying more then bare Ideas of that Happinesse, which the atchievements of our designs promiseth. I shall desire you to shew them unto no more then needs you must, since they can please only those few, that are Reall Friends to the Designe of Realities, not those who are tickled only with Rhetorical Prefaces, Transitions, & Epilogues, & charmed with fine Allusions and Metaphors, (all which I do not condemn) wherewith, as I had no abilities to adorne my discourse, so I wanted all other requisites thereunto, Having written it (as Your self must beare me witnesse) at your own Importunity in the midst of my cares and indeavours, to perfect mine Invention, and which is work in the midst of my hard and perhaps unprofitable labour, to prevent the ingratitude and backwardnesse of men to reward him, who shall earnestly labour to expresse himselfe,

London the 8.
January. 1648

Yours and your desires

most affectionate servant,

W. P.



THE Advice

For Advancement of some particular Parts of Learning.



DO give an exact Definition or nice Division of Learning, or of the Advancement thereof, we shall not undertake (it being already so accurately done by the great Lord *Verulam*) Intending onely to shew where our owne shoe pincheth us, or to point at some pieces of Knowledge, the improvement whereof (as we at least conceive) would make much to the enerrall good and comfort of all mankind, and withall to deliver our own opinion by what meanes they may be raised some one degree neerer to perfection.

But before we can meddle with this great Work, we must first think of getting Labourers, by appointing some Generall Rande vousz, where all men either able or willing to take up armes against the many difficulties thereof, may finde entertainment. That is to say, We must recommend the Institution of an Office of common Adresse according to the projection of Master *Hartlib* (that painfull and great instrument of this Designe) whereby the wants and desires of all may bee made knowne unto all, where men may know

what is already done in the buisinesse of Learning. What is at present in doing, and what is intended to be done: to the end, that by such a generall communication of designes, and mutuall assistance; The wits and endeavours of the world may no longer be as so many scattered coales or firebrands, which for want of union, are soone quenched, whereas being but layed together they would have yeelded a comfortable light and heat. For me thinks the present condition of men is like a field where a battle hath beene lately fought, where we may see many leggs, and armes, and eyes lying here and there, which for want of a union and a soule to quicken and enliven them, are good for nothing but to feed Ravens; and infect the aire. So we see many Wittes and Ingenuities lying scattered up and downe the world, whereof some are now labouring to doe what is already done, and pusing themselves to reinvent what is already invented, others we see quite stuck fast in difficulties, for want of a few Directions, which some other man (might he be met withall) both could and would most easily give him; againe one man wants a small summe of mony, to carry on some designe, that requires it, and there is perhaps another, who hath twice as much ready to bestow on the same designe, but these two having no Meanes ever to heare the one of the other, the good Work intended and desired, by both parties doth utterly perish and come to nothing: But this we passe over sleightly, though very fundamentall to our buisinesse, because the Master-builder thereof himself hath done it so solidly. Having by this means procured work-men and what else is necessary to the Worke, that which we would have them to labour in, is, How to finde out such Arts as are yet undiscovered, How to learne what is already known, by more compendious and facile wayes, and to apply it to more, and those more noble uses, how to work in men an higher esteeme of Learning so as to give occasion, encouragement and opportunity to more Men to apply themselves to its Advancement.

The next thing then to be done, will be, First, to see what is well and sufficiently done already, exploding whatsoever is nice, contentious and meery phantastical. All which must in
some

some measure be suppressed and brought into disgrace and contempt with all men.

2. This survey may be made by perusing all Books and taking notice of all Mechanicall Inventions:

3. In this perusal, all the Real or Experimentall Learning may be sifted and collected out of the said Books.

4. There must be appointed able Readers of all such Books, with certaine and well limited Directions what to collect out of them.

5. Every Book must be so read by two severall Persons apart, to prevent mistakes and failings from the said Directions.

6. The Directions for Reading must be such, as the Readers observing them, may exactly agree in their Collections.

7. Out of all these Bookes one Booke or great Worke may be made, though consisting of many Volumes.

8. The most Artificiall Indices Tables or other Helps for the ready finding, remembering, and well understanding all things contained in these Bookes must be contrived and put in practice.

Having thus taken the height or pitch wherunto all Arts and Sciences whatsoever, are already come; and observed where they now stick, the ablest Men in every respective Faculty must be set apart, to drive them on further with sufficient maintenance, and encouragement for the same. Wherunto it is requisite that two or three, one under another, be employed about each Faculty, to the end that some of them dying, or any other wise failing, there may never want men acquainted with the whole Designe, and able to carry it on, with the help of others to be admitted under them; And that at least yearly Accompts be taken of those mens endeavours, and rewards be proportioned to them accordingly.

And now we shall think of whetting our tooles and preparing sharp Instruments for this hard work, by delivering our thoughts concerning Education, which are,

1. That there be instituted *Ergastula Literaria*, Literary-work-

work-houses, where Children may be taught as well to doe something towards their living, as to Read and Write.

That the businesse of Education be not (as now) committed to the worst and unworthiest of men, but that it be seriously studied and practised by the best and abler persons:

That all Children of above seven yeares old may be presented to this kind of Education, none being to be excluded by reason of the poverty and inability of their Parents, for hereby it hath come to passe, that many are now holding the Plough, which might have beene made fit to steere the State. Wherefore let such poor children be employed on works whereby they may earne their living, equall to their strength and understanding, and such as they may performe as well as elder and abler persons, *viz.* attending Engines, &c. And if they cannot get their whole living, and their Parents can contribute nothing at all to make it up, let them stay somewhat the longer in the Work-house.

That since few children have need of reading before they know, or can be acquainted with the Things they read of, or of writing, before their thoughts are worth the recording, or they are able to put them into any forme, (which we call inditing) much lesse of learning languages, when there bee Books enough for their present use in their owne mother Tongue; our opinion is, that those Things being withall somewhat above their capacity, (as being to be attained by Judgement, which is weakest in children) be deferred awhile, and others more needfull for them, such as are in the order of Nature before those afore mentioned, and are attainable by the help of Memory, which is either most strong or unpre-occupied in children, be studied before them. We wish therefore that the Educands be taught to observe and remember all sensible Objects and Actions, whether they be Naturall or Artificiall, which the Educators must upon all occasions expound unto them.

That they use such Exercises whether in work, or for recreation, as tend to the health, agility and strength of their bodies.

That they be taught to Read by much more compendious
meanes

meanes then are in common use, which is a thing certainly very easie and feasible.

That they be not onely taught to Write according to our Common Way, but also to Write Swiftly and in Reall Characters, as likewise the dextrous use of the Instruments for Writing many Copies of the same thing at once.

That the Artificiall Memory be thought upon, and if the precepts thereof be not too farre above Childrens Capacities, We conceive it not improper for them to learn that also.

That in no case the Art of Drawing and designing be omitted, to what course of Life soever those children are to be applied, since the use thereof for expressing the conceptions of the mind, seemes (at least to us) to be little inferiour to that of Writing, and in many cases performeth what by words is impossible.

That the Elements of Arithmetick and Geometry be by all studied, being not onely of great and frequent use in all humane Affaires but also sure guides and helps to Reason, and especial Remedies for a volatile and unsteddy mind.

That effectuall Courses be taken to try the Abilities of the Bodies and Minds of Children, the strength of their Memory, inclination of their Affections either to Vice or Vertue, and to which of them in particular, and withall to alter what is bad in them, and increase and improve what is good, applying all, whether good or bad, to the least Inconveniencie and most Advantage.

That such as shall have need to learne Forraine Languages (the use whereof would be much lessened, were the Reall and Common Characters brought into practise) may be taught them by incomparably more easie wayes then are now usuall.

That no ignoble, unnecessary, or condemned Part of Learning be taught in those houses of Education, so that if any man shall vainely fall upon them, he himselfe onely may be blamed.

That such as have any naturall ability and fitnesse to Musick be Encouraged and Instructed therein.

That all Children, though of the highest ranke, be taught some gentile Manufacture in their minority, such as are
Turning of curious Figures. Making

Making Mathematicall Instruments, Dialls, and how to use them in Astronomical Observations.

Making Watches and other Trochilick motions.

Limning and Painting on Glasse or in Oyle Colours.

Graving, Etching, Carving, Embossing and Molding in sundry matters.

The Lapidaries Art of knowing, cutting and setting Jewells.

Grinding of Glasses Dioptrickall and Catoptrickall, Botanicks and Gardening.

Making Musickall Instruments.

Navarchy and making Modells for buildings and rigging of Ships.

Architecture and making Modells for houses.

The Confectioners, Perfumers or Diers Arts.

Chymistry, refining Metalls and Counterfeiting Jewells.

Anatomy making Sceletons and excarnating bowells.

Making Mariners Compasses, Globes, and other Magnetick Devices.

And all, for these Reasons.

1. They shall be lesse subject to be cousened by Artificers.
 2. They will become more industrious in generall.
 3. They will certainly bring to passe most excellent Works, being as Gentlemen, ambitious to excell ordinarie Work-men.
 4. They being able to make Experiments themselves, may doe it with lesse charge, and more care then others will doe it for them.
 5. The *Resp. Artium* will be much advanced, when such as are rich and able, are also willing to make Luciferous Experiments.
 6. It may engage them to be Mecænates and Patrons of Arts.
 7. It will keepe them from worse occasions of spending their time and estates.
 8. As it will be a great Ornament in prosperity, so it will be a great Refuge and stay in adversty and common calamity.
- As for what remaines of Education, we cannot but hope that

that those, whom we have desired should make it their trade, will Supply it, and render the Idea thereof much more perfect.

We have already recommended the studie of the Elements of Arithmetick and Geometry to all Men in generall, but they being the best grounded parts of Speculative knowledge, and of so Vast use in all Practicall Arts, We cannot but commend deeper enquiries into them. And although the way of advancing them in particular, may be drawne from what we have already delivered, concerning the Advancement of learning in generall, yet for the more explicite understanding of our meaning herein, we referre to Master *Pells* most excellent Idea thereof, written to Master *Hartlib*.

In the next place for the Advancement of all Mechanicall Arts and Manufactures, we wish that there were erected a *Gymnasium Mechanicum* or a Colledge of Trades-men (or for more expedition untill such a place could be built, that the most convenient houses for such a purpose may be either bought or hired) wherein we would that one at least of every Trade (but the Prime most Ingenious Work-man, the most desirous to improve his Art,) might be allowed therein, a handsom dwelling Rent free, which with the Credit of being admitted into this Society, and the quick sale which certainly they would have of their Commodities, when all men would repaire thither, as to a Market of rare and exquisite pieces of Workmanship, would be a sufficient Motive to attract the very ablest Mechanicks, and such as we have described, to desire a fellowship in this Colledge.

From this Institution we may clearly hope when the excellent in all Arts are not onely Neighbours, but intimate Friends and Brethren, united in a Common desire and zeal to promote them, that all Trades will miraculously prosper, and new Inventions would be more frequent, then new fashions of Clothes and household-stuffe. Here would be the best and most effectuall opportunities and meanes, for writing a History of Trades in perfection and exactnesse, and what Experiments and stuffe would all those Shops and Operations afford to Active and Philosophicall heads, out of which, to extract that Interpretation of Nature, whereof there is so little, and that so bad as yet extant in the world?

Within the walls of this Gymnasium or College, should be a *Nosecomium Academicum* according to the most exact and perfect Idea thereof a compleate *Theatrum Botanicum*, stalls and Cages for all strange Beastes and Birds, with Ponds and Conservatories for all exotick Fishes, here all Animalls capable thereof should be made fit for some kind of labour and employment, thaa they may as well be of use living as dead; here should be a Repositorie of all kind of Rarities Naturall and Artificiall pieces of Antiquity, Modells of all great and noble Engins, with Designes and Platformes of Gardens and Buildings. The most Artificiall Fountaines and Water-works, a Library of Select Bookes, an Astronomicall Observatory for celestiaall Bodies and Meteor, large pieces of Ground for severall Experiments of Agriculture, Galleries of the rarest Paintings and Satues, with the fairest Globes, and Geographcall Maps of the best descriptions, and so farre as is possible, we would have this place to be the Epitome, or Abstract of the whole world. So that a man conversant within those walls, would certainly prove a greater Schollar, then the Walking Libraries so called, although he could neither write nor read. But if a Child, before he learned to read or write, were made acquainted with all Things, and Actions (as he might be in this Colledge) how easily would he understand all good Bookes afterwards, and smell out the fopperies of bad ones. As for the Situation, Modell, Policy Oeconomy, with the Number of Officers and Retainers to this Colledge, and the Priviledges thereof, it is as yet time enough to delineate. Only we wish that a Society of Men might be instituted as carefull to advance Arts as the Iesuites are to Propagate their Religion for the government and manning of it.

But what relish will there be in all those dainties whereof we have spoken, if we want a palate to tast them, which certainly is Health, the most desirable of all earthly blessings, and how can we in any reason expect Health, when there are so many great difficulties in the curing of diseases and no proportionable Course taken to remove them? we shall therefore pursue the Meanes of acquiring the Publicke Good and
com-

comfort of Mankind a little further, and vent out conceits concerning a Nosocomium Academicum or an Hospitall to cure the Infirmities both of Physician and Patient.

We intended to have given the most perfect Idea of this Nosocomium Academicum, and consequently to have treated of the Situation and Fabrick of the House, Garden, Library, Chymicall Laboratorie, Anatomical Theator, Apotheca, with all the Instruments and Furniture belonging to each of them, as also of the whole Policy and Oeconomy thereof. But since such a work could not be brought to passe without much charge (the very naming wherof doth deter men even from the most noble and necessary Attempts) we are contented to portray only such a Nosocomium, as may be made out of one of our old Hospitals, without any new donations or creeping to Benefactors, onely with a little paines taken by the Reforming hand of Authority. For we do not doubt, but that we have so contrived the businesse, that there is no Hospitall in its corrupt estate, can be more thriftily managed then Ours. For the Number of our Ministers are no greater then usuall, and absolutly necessary; their Pensions no larger then are allowed to those, who do not make the service of the Hospital, the sixth part of their Employment and meanes of subsistence, and yet we give encouragement enough to able men to undertake it, without meddling with any other businesse, which we strictly forbid. For as the Salaries are but small, so the Charge of the Ministers is not great (they being all to be unmarried Persons) their Accommodation handsome, their Employment (being a work of Publike and highest Charity) honourable, and to Philosophicall Men, (who onely are to have a hand in this businesse) most pleasant and delightfull. Besides when their respective times are expired, their profit and esteeme in the world cannot but be very great. For their way of breeding will both procure them practice among such as are able to reward them, and give them a dexterity and ability, to manage and go thorough a great deale thereof.

Moreover the smalnesse of the Salary, the long servitude among poore wretches, and restraint from Marriages, the great paines and naturall parts required to performe duties,

will I hope, prevent all intrusions of those, whose Genius doth not encline them to take pleasure in this way of life.

Wherefore being not at leisure to frame Utopias; we shall onely speak of the Number and Salary of Ministers, the time of their service with their qualifications in generall, and Duties in particular; which are to be employed in this Nosocomium Academicum.

The Nosocomium being fitted with all manner of Necessaries, shall be overseene by three or foure Curators, Men of Learning, Honour and Worth, such as shall out of Charity and good will to the Publique performe this Trust, who are to be Protectors and Chancellors thereof, as also Auditors of the Stewards Accompts.

Besides these, there shall be a Mathematician for Steward; a Physician, Chirurgion and Apothecary, each well versed both in the Theory and Practise of their respective Professions. A young Physician capable at least of the degree of Doctor, who may be called the Vice-physician, and another of about five or sixe yeares standing in the University, who may be called the Student. There should be also a Chirurgion and an Apothecary who have served their Apprentiships in the said Faculties called the Chirurgions and Apothecaries Mate, with two other young men, the one to serve the Chirurgion, and the other the Apothecary, all understanding at least the Latine Tongue, which may be called the Apprenticcs: All these are to be chosen at first by the Curators (but afterwards by the Society it selfe) being such as they shall be certified are Pious, Ingenious, Laborious, Lovers of Knowledge, and particularly of the Faculty of Physick, courteous, not covetous; and lastly such among whom there may be an harmony of Natures and studies, so as all feare of discords, Envie and Emulation may be taken away. There ought also to be entertained, as many honest carefull ancient Widowes, to serve as Nurses to the sick, as will be proportionable to their Number, some whereof are to be ordinary and some extraordinary; whereof the latter may be taken in, and dismissed againe, as Occasion of their help, requires,

There should be allowed out of the Revenues of the Hospital

pitall to the aforementioned Ministers, besides their diets, house-
 roome, washing, firing, &c. and Exemption from all Taxes
 and Employments in the Common-wealth, the severall sums
 following, viz.

To the Steward	80	} per annum.
To the Physician	120	
To the Vice-Physician	50	
To the Chirurgon and Apothec. each	60	
To the Student	25	
To the Chirurg. and Apotheck. mate	20	
To each of the Apprentices	10	
To each ordinary Nurse	4	
To an Extraordinary by the week	3. shil.	

It should be granted by the State, that whosoever hath ser-
 ved his respective time in the Nosocomium, and hath a Certi-
 cate therof from the Society, shall be thereby licensed to pra-
 ctice his profession in any place or Corporation whatsoever,
 notwithstanding any former Law to the Contrary.

The Steward shall not be obliged to stay any longer then
 from yeer to yeer. Each of the Faculty of Physick may serve
 five yeers in each degree thereof, each of the Chirurgons and
 Apothecaries but foure.

These Circumstances being premised, we now come to the
 very Essence of the whole businessse, that is, to the Description
 of each of the aforementioned Ministers their particular Duty and
 Function, which are as followeth, viz.

The Steward shall be a man of approved honesty, able to
 give order for all reparations about the house, garden, &c. to
 agree and bargain with workmen, and all that shall serve in
 any Commodities into the house, he is to receive and pay all
 monies, and submit the accompts thereof to the whole Soci-
 ety, and they againe to the Curators. For which and other like
 duties he ought to be skill'd in Mathematicks; chifely in Ar-
 thmetick and keeping Accompts, measuring of Land, tim-
 ber, board, Architecture, frugall contrivances and the like.
 But as to the Advancement of Physick, We desire he

may be skill'd in the best Rules of Judiciall Astrology, which he may apply to calculate the Events of diseases, and Prognosticate of the Weather; to the end that by his Judicious and carefull Experiments, the Wheat may be separated from the Chaffe in that Faculty likewise; and what is good therein may be applyed to good uses, and the rest exploded. He shall keep a Journall of all notable Changes of Weather, and fertility of Seasons, taking notice what fruits, &c. have abounded and what have failed, which have beene good, and which bad, with the Reasons thereof, whether the same were caused by Mildewes, Blasts, Unseasonable Weather, Caterpillers or other Vermin; he shall take notice of the severall diseases, as Staggers, Murraine, Rot, &c. which in each yeare have infested each Species of Animals, and what Insects have most abounded; all which Particulars with the Epidemicall diseases befalling man, he may compare with the Aspects of the Celestiall bodies, and so examine the precepts delivered unto us by the Professors of that Art.

The Physician must be a Philosopher, skill'd at large in the Phenomena of Nature, must understand the Greek Tongue, be well read in good Authors, and seene in the practice of all the ministrant parts of Physick, willing to instruct and forward all that are under him, his work shall be twice every day deliberately to Visite and Examine all the Sick, and after due Consideration of their Condition, to prescribe them convenient Medicines, and shall dictate in Latine to the Vice-Physician attending him, the History of their severall Diseases (excluding impertinencies) he shall see all Patients in outward griefes (to whom he administreth any inward remedies) opened and dressed ever now and then, to the end that himselfe and the Chirurgeon may both have the same Intention and scope in their practice. He must take care that the Chirurgeon and Student keep the History of their Cures likewise, and that the Apothecary and Student doe the same in in their Pharmacy and Botanicks. He shall oversee the dispensation of all compound, and Preparation of all Chymical Medicaments, giving the Apothecary directions for the making of new Enquiries and Experiments in his way; and like-

wife to the Chyrurgeon and the rest, in theirs, when he seeth them not otherwise employed. In briefe, he shall have an influence upon all the rest, and all the rest reciprocally upon him, so that he being made acquainted with all the Histories taken in the Hospitall, Laboratory, Anatomical Chamber, garden, &c. may give the reason of the most notable Phænomena hapning in either of them. All which he shall commit to writing and out of them, by the end of the terme of his service, shall collect a Systeme of Physick and the most approved Medicinall Aphorismes; taking notice by the way where those of Hippocrates are deficient or true, and by how many severall experiments he hath so found them. He shall either dissect or overlook the dissection of bodies dying of diseases, and lastly shall take care that all Luciferous experiments whatsoever, may be carefully brought to him, and recorded for the benefit of Posterity.

The Vice-Physicians proper charge is to see the History of Patients most exactly and constantly kept, he may now and then reade some good Authour, but in all other things shall endeavour to assist, and be subordinate to the Physician in all parts of his duty, stil acting by his directions, but shall not prescribe any Physick without the consent of the Chiefe, nor in his absence, upon emergent occasions, without the advice of the Master Chyrurgeons; he should be alwayes walking up and downe from bed to bed, feeling the pulses and looking on the Vrine and other excrements of the sick; that no considerable punctilio in any circumstance whatsoever escape his observation; for the compleating of the History, He shall apply himselfe to the making of Luciferous experiments, and to take notice of such as shall be made by others.

The Student shall assist the Chyrurgeon and Apothecary in making the History of their Practises, to the end he may have alwayes occasions to instruct himselfe in these ministrant parts of physick to read such Authors, as the Chiefe Physician shall appoint him, and compare all his reading with the things themselves, whereof he readeth, as herbs, drugs, Compound Medicaments; Anatomy, Chyrurgicall Instruments, bandages, operations, &c. all which we call the Real Elements

ments of the Art. He shall by leave from the Physician in cases of need, put his hand to helpe the Chyrurgion or Apothecary and sometimes watch by night with the Nurses, that the perfection of the History may by no meanes be hazarded on their Ignorance or carelesnesse; he may serve the Physician as an Amanuensis, especially in such things, the transcribing whereof may tend much to the advancement of his owne knowledge.

Of the Chirurgions.

The Master Chyrurgion shall dresse every Patient belonging to his care the first time himselfe, in the presence of him, to whom he shall commit the said Cure afterwards, and as it were read him a Lecture thereupon. When the other Chirurgions under him are dressing, he shall, accompanied with the student, goe from Patient to Patient to give them directions *pro re Natâ* in their proceedings on the Cure, and dictate to the Student the most pertinent passages hapning from time to time, that he may keep a true and uninterrupted History of them; He shall make Experiments by dissecting sundry sorts of Animals, shall teach his Mates Anatomy, expound good Authors to them, shew them the Manner of making bandages and making all Manner of operations such as are the Laryngotomia, cutting for the stone, hernia, drop sic and applying the trepane both upon living brutes and dead carcases of men to the end that by practising upon these, the best places for making incision may be knowne, and all the dangerous parts in the way taken notice of, and upon the others, how to avoide the Inconveniencies of hæmorrhagies, struglings and the like.

The Mate shall dresse all the more difficul griefes, apply Cauteries, rake Fontanels, practise Anatomy, and Manuall operations make Sceletons of the Sundry rare Animals which he shall have the opportunity to cut up, excarnate bowels, artificially dry the Muscles tanne the ventricle, guts, &c. and do what else tendeth to the perfection of Anatomy, he shall al-

so at leifuretimes transcribe the History of their practice first and originally taken by the Student.

The Apprentice shall serve the Master in spreading Plaisters, letting Blood in the arme, threading Peale for Issues, whetting Instruments, scraping Lint, sowing together Bandages (which he shal also learne to apply) he shal see dissections, read good Authors of Chirurgery and see the practice of operations made by his Superiours. He shall also see the Apothecaries make all such Plaisters, Unguents, Balsames, &c. (learning to choose and know all the Herbs, Gummes and other Ingredients going into them) as are used in their practice.

Of the Apothecarie.

The Master Apothecary being a most exquisite Botanist, shall take care of the Garden, that store of all usefull Plants be kept therein, and also that such as are for beauty or rarity be not wanting, he shall give order for all Experiments of Grafting, Transplanting, Meliorating the tafts, smels, &c. of Plants, accelerating of Germination and Maturation in them, conservation of Exoticks so, as in time to make them Domesticks, to try the effect of all Artificial Composts, he shall see that all Herbs, Roots, &c. be gathered in their due seasons, and that all the most proper Courses be used for conserving them, hee shall write of the sensible and evident Qualities of all Drugges, as of their smell, taft, ponderosity, rarity, friability, transparency, colour, hardnesse, &c. omitting such as are not discernable by sense, or deprensible by certaine Experiments, declaring the severall operations, chymicall or Pharmaceuticall by which these Drugges are usually, or may be best prepared; he shall set down all the Experiments solitary or in consort, that he meeteth with, in the mixing or preparing any of them, as that Camphire, will of it selfe evaporate, Terpentine washed in
water

water becometh white, Euphorbium in the beating will cause excessive sneezing, that the feedes of Cucumis .Afininus will of themselves leap out with great Impetuosity one after another. That spirit of Vitriol mixed with Syrup of Violets, turneth it into a faire Crimson colour, and others of the like Nature. He shall with the Student keep an exact History of all rare and Unusuall Accidents, hapning in his Operations, he shall take care that all Medicaments be made according to Art, or the Physicians particular directions: he shall ever now and then Visite the Apotheca, to cast out thereof all decayed Drugges and compositions, shall read Pharmaceutical and Chymicall Institutions to his Inferiors, and teach the plants to any of the Society that shall desire to learne them.

The Apothecaries Mate shall transcribe the prescriptions taken by the vice Physician, and see them carefully made up, shall attend the Hospitall, in administering to each Patient his Physick according to directions, applying Epithemes, cucuphaes Embrochaes, fomentations, frictions, unctions, giving Glysters, applying Leeches, &c. he shall transcribe the History compiled by the Master Apothecary, and the student, and at leisure times, when as he cannot study Things he may read good Authors in his owne Art, without meddling either with Physick or Chyrurgery.

The Apprentice shall read some good pharmaceuticall Botanick and Chymicall Institutions, shall be much conversant in the Garden to see the curing of tender and exotick plants where he shall observe the working of Nature in their growing flourishing, &c. he shall see the Herbs, Roots and Seeds gathered according to directions, he shall worke in beating and picking Drugs and on all other Operations belonging to the preparation of Medicaments.

The Nurfes shall be alwayes at hand in the Hospitall to help the sick, that by reason of their absence they may not be put to straine and offend themselves by often and loud crying and calling. They shall dresse their diet
and

and give it them in Quality, Quantity, Time and order; according to the Physicians directions, they shall see their Linnen conveniently changed so as to prevent all annoyance to the sick; They shall in watching endeavour to observe all remarkable Accidents hapning in the night, as whether they raved or talked much in their sleepe, snorted, coughed, &c. all which they shall punctually report to the Physician, shewing him the Urines and other Excrements, telling him the time and manner wherein they were voyded, and in breife, they being the lowest Members of the house, they shall be in all things obedient to their Superiours.

It is hard so to assigne to every Minister his particular duty, as that the businesse (which is the Recovery of the Patients, and the Improvement of every mans knowledge in his proper way) cannot be done better then by this distribution: And it would be of ill Consequence, if hereupon the Apprentice having done his owne work, should refuse to help his fellow, being perchance at some time overburthened, wherefore it is to be understood that this contrivance shall be no warrant to any man, not to help his fellow, in case of Exigence, but chiefly to shew what we desire should be done amongst them all. For we hope that their common Friendship and desire of helping the sick and enabling themselves, will tye them enough to performe all these things in the most advantagious manner to these Ends.

Having now after a fashion gone through the description of such Societies and Institutions, as we have thought most fit for the advancement of Reall Learning, and among the rest, of the *Ergastulum Literarium* for the Education of Children, we now come to speak of such Bookes, as being well studied and expounded in those Schooles, would lay a very firme foundation of Learning in the Schollers.

We recommend therefore in the first place (besides those Bookes of Collection, by us formerly mentioned, and *Ma-
ster Pells* three Mathematical Treatises) the compiling of a

Worke whose Title might justly be *Vellus Aureum sive Facultatum Luoriferarum discriptio Magna*, wherein all the practised wayes of getting a Subsistence and whereby Men raise their fortunes, may be at large declared. And among these, we wish that the History of Arts or Manufactures might first be undertaken as the most pleasant and profitable of all the rest, wherein should be described the whole Processe of Manual Operations and Applications of one Naturall thing (which we call the Elements of Artificials) to another, with the necessarie Instruments and Machines; whereby every peice of worke is elaborated, and made to be what it is, unto which work bare words being not sufficient, all Instruments and tooles must be pictured, and colours added when the descriptions cannot be made intelligible without them.

This History must not be made out of a farrago of imperfect Relations made to the compiler, either by too rude or coufening Workmen, but all things thereunto appertaining must be by himselve observed and attested by the most Judicious and candid of each respective Profession, as well to make the work the more Authentick, (it being to be the Basis of many future Inferences and Philosophations) as the more cleerly and distinctly to enforme the compiler himselve, by whose Judgement as the Alembick and Industry as the fire, it is hoped that the Quintessence and Magisteries of all present Inventions may be extracted and new ones produced in abundance.

Although it be intended to teach the making of all Artificials, yet it is not to be understood that when there hath beene taught how to make a stoole, or a naile of one fashion, that the Art of making a Chaire or a naile of another fashion, should belong insisted on. But the Compiler should strive to reduce the making of all Artificials in each trade to a certaine Number and Classes of operations Tooles and Materials, neither need he to set the Figures, or mention the names of all Artificials that ever were made, but onely of such as are most Knowne and of Common Use
amongst

amongst men: He needeth not to describe every punctilio in making all the aforementioned particulars, and yet leave no more defects, then may be supplied by every common understanding. For we question whether (if he should engage himselfe in such an endlesse labour) a man by the bare light and instruction of the Book could attaine to a dextrous practice of a trade, whereunto hath been required seven yeares Autopsia. But are confident that the help of this Book will lessen the former tæditum by more then half. He should not so abridge the Work as not to distinguish between Instruments of the same name, as between a Loom to weave Kersies, and another, wherein to weave silk Ribbands or Stockings.

He should all along give the Mechanicall reason of every Instrument Materiall and operation, when the same is sensible and cleere. He should all along note his own defects in setting down these Histories, in case he had not at the time of the writing thereof sufficient information, and withall the deficiencies of the Trades themselves.

Now whereas there be divers Wayes and Methods of working most Manufactures, he should in each thing stick close to the way of some one Mr. but note al the diversities he Knoweth, & give his Opinion of the use and goodnes of each.

Moreover the Oeconomy, *Sive Ars augenda rei familiaris* in all Professions ought to be enquired into. *viz.* What seasons of the yeare are most proper to each Worke, which the best places and times to buy Materials, and to put off the Commodities when finished, how most thriftily to hire, entertaine, and oversee servants and Workmen, how to dispose of every excrement and Refuse of Materials, or of broken, worne, or otherwise unserviceable Toolles and Utensils, with all Cauteles, Impostures and other sleights good, or bad, whereby men use to over-reach one another.

There ought to be added to this work many and various indices besides the Alphabeticall ones, as namely one of all the Artificials mentioned in the whole worke.

Another of all the Naturall Materials or Elements of Artificials, by what Artificers used, from whence they come,

where to be had, and what are the ordinary and middle prices of them.

Another of all the Qualities or Schemes of Matter, as of all liquifiable things visced friable, heavy, transparent, absterfivè or otherwise qualified according to all the classes of 1, 2, and 3. qualities, to the end that Materials for all Intentions and Experiments may be at hand and in sight.

Another of all Operations mentioned in the whole work, as Sawing, Hewing, Filing, Boaring, Melting, Dissolving, Turning, Beating, Grinding, Boyling, Calcining, Knitting, Spinning, Sowing, Twisting, &c. To the end that they all may also be at hand for the purposes aforesaid. Another of all Toolcs and Machines, as Files, Sawes, Chissels, Sheeres, Sives, Loomes, Shuttles, Wheelcs, Wedges, Knives, Skrewes, &c. for the same purpose also.

The compiler ought to publish all his conjectures how old Inventions may be perfected and new one produceds, giving directions how to try the truth of them. So that by all those unto whose hands these Books shall come perchance, all the said suppositions may be tryed, and the successe reported to the Compiler himselfe.

The Compilers first scope in Inventions shall bee, how to apply all Materials that grow in Abundance in this Kingdome, and whereof but in considerable use and Profits are as yet made to more advantage to the Common-wealth. And also how all Impotents, whether onely blind, or onely lame, and all Children of above seven yeares old might earne their bread, and not be so long burdnesome to their Parents and others.

There should be made a Preface to the Worke to teach men how to make the most of experiments and to record the succesles of them whatsoever, whether according to hopes or no, all being equally Luciferous, although not equally Lucriferos.

There ought to be much Artifice used, that all the aforementioned Indices may handfomely referre One to anothers, that all things contained in the whole Book

may be most easily found, and most readily attend the seekers of New Inventions.

The way to accomplish this Worke must be to enquire what to this purpose is already done, or in hand, in all places and also by whom, so that Communication of counsels and proceedings, may (if possible) be had with those undertakers.

All Bookes of this Subject already extant in Print, must be collected and bought, not to transcribe them, but to examine them per Autopsiam, and Re-experiment the Experiments contained in them, and withall to give hints of New Enquiries.

The Compiler must be content to devote his whole life to this employment, one who (as we said before) hath the fire of Industry and the Alembick of a Curious and ratioll head, to extract the Quintessence of whatsoever hee teach.

He should bee as young as sufficient Abilities will admit, to the end that he may with the concurrence of Gods ordinary Providence, either finish, or very farre advance the Worke, while he liveth, and also that living long in that employment, he may heap up the larger stock of Experiments, which how much the greater it is in one Man, affordeth so much the more hopes of New Inventions.

The Nature, Manner, and Meanes of Writing the History of Trades being so farre expounded, before we proceed further therein, for the better Encouragement of Vndertakers, we shall now represent such Profits and Commodities thereof, to the Common-wealth, as we at present more nearly reflect upon. For to Enumerate or Evaluate them all, will be much above our Capacity.

1. All men whatsoever may hereby so look into all Professions, as not to be too grossely cozened and abused in them.

2. The Mysteries of Trades being so laid open, as that the Professors of them cannot make so unlawfull and exorbitant

advantages as heretofore, Such as are Cunning and Ambitious will never rest untill they have found new ones in their stead ; so that the *Respublica Artium*, will be so much the more advanced.

3. Schollers and such as love to Ratiocinate will have more and better Matter to exercise their wits upon, whereas now they puzzle and tire themselves, about meer Words and Chymericall Notions.

4. They will Reason with more alacrity, when they shall not only get honour by shewing their Abilities, but profit likewise by the Invention of Fructiferous Arts.

5. Sophistry shall not be in such esteem as heretofore, when even Sense shall be able to unmask its vanity, and distinguish it from Truth.

6 Men seeing what Arts are already invented, shall not neede to puzzle themselves to reinvent the same againe.

7. All Men in generall that have wherewithall will be venturing at our *Vellus Aureum*, by making of Experiments : and whether thereby they thrive or no (the Directions in the Preface being followed) they shall neverthelesse more and more discover Nature.

8. Nay all Nations sensible of this *Auri Sacra fames*, will engage in this hopefull businesse ; and then certainly Many hands will make light work in the said businesse of discovering Nature.

9. All Ingenious Men and Lovers of Reall Knowledge, have along time begged this work, wherefore it can be no small honour to him that shall satisfie them.

10. A vast increase of honourable, profitable, and pleasant Inventions must needs spring from the work , when one Man (as the Compiler thereof) may *uno intuitu*, see and comprehend all the Labour and Wit of our Ancestors, and be thereby able to supply the defects of one Trade with the perfections of another.

11. We see that all Countries where Manufactures and Trades flourish, as *Holland*, &c, become potent and rich.

For

For how can it otherwise be ? when the Revenues of the State shall be encreased by new and more Customes, all Beggars feeding upon the Labours of other men, and even Theeves and Robbers (made for want of better employment) shall be set on work, barren grounds made fruitfull, wet dry, and dry wet, when even hogs and more indocile beasts shall be taught to labour, when all vile Materials shall be turned to Noble uses, when one man or horse shall do as much as three, and every thing improved to strange Advantages.

12. There would not then be so many Fustian and Unworthy Preachers in Divinity, so many petti foggers in the Law, so many Quack-salvers in Physick, so many Grammaticasters in Country-schools, and so many Lazy-serving men in Gentlemens houses, when every man might learne to live otherwise in more plenty and honour. For all men desirous to take paines might by this Book survey all the wayes of Subsistence, and choose out of them all, one that best suits with his own Genius and Abilities.

13. Schollers now disesteemed for their Poverty (what ever other thing commendsthem) and unable even for want of lively-hood, to perfect any thing even in their own way, would quickly help themselves, by opening Treasures, with the Key of Lucriforous Inventions.

14. Boyes instead of reading hard Hebrew words in the Bible (where they either trample on, or play with Mysteries) or parratlike repeating heteroclitous nouns, and verbs, might read and hear the History of Faculties expounded, so that before they be bound Apprentices to any Trade, they may foreknow the good and bad of it, what will and strength they have to it, and not spend seven years in repenting, and in swimming against the stream of their Inclinations.

All Apprentices by this Book might learn the Theory of their Trades before they are bound to a Master, and consequently may be exempted from the *Tadium* of a seven

seven years bondage, and having spent but about three years with a Master, may spend the other foure in Travelling to learn breeding, and the perfection of their Trades.

As it would be more profitable to Boyes, to spend ten or twelve years in the study of Things, and of this Book of Faculties, then in a rabble of words, so it would be more easie and pleasant to them, as more suitable to the naturall propensions we observe in them. For we see Children to delight in Drums, Pipes, Fiddels, Guns made of Elder-sticks and bellows noses, piped Keyes, &c. for painting Flags and Ensignes with Elder-berries and Corn-poppy, making ships with Paper, and setting even Nut-shells a swimming, handling the tooles of workemen as soone as they turne their backs, and trying to worke themselves, fishing, fowling, hunting, setting sprenges and traps for birds, and other animals, making pictures in their writing bookes, making Tops, Gigs, and Whirligigs, quilting balls, practising divers juggling tricks upon the Cards, &c. with a million more besides. And for the Females, they will be making Pyes with Clay, making their Babies Clothes, and dressing them therewith, they will spit leaves on sticks, as if they were roasting meate, they will imitate all the talke and Actions, which they observe in their Mother and her Gossips, and punctually act the Comedy or Tragedy (I know not whether to call it) of a Womans lying in. By all which it is most evident, that Children do most naturally delight in things, and are most capable of learning them, having quick Sences to receive them and unpreoccupied memories to retainethem. As for other things whereunto they are now adayes set, they are altogether unfit, for want of judgement, which is but weake in them, and also for want of *Will*, which is sufficiently seene both by what we have said before, by the difficultie in keeping them at Schools, and the punishment they will endure rather than be altogether debarred from this pleasure which they take in Things.

This work will be an help to Eloquence, when men by their great acquaintance with things, might find out Similitudes, Metaphors, Allusions, and other graces of discourse in abundance.

To Arithmeticians and Geometricians, supplying them with Matter whereupon to exercise those most excellent Sciences, Which some having with much paines once learned, do for want hereof forget againe, or unprofitably apply about resolving needlesse Questions, and making of new difficulties. The number of mixt Mathematicall Arts would hereby be encreased.

For we see that Opticks are made up of pure Mathematicks, the Anatomy of the eye, and some Physicall Principles concerning the Nature of light and Vision, with some Experiments of convexe and concave glasses, Astronomy is constituted againe of them, and some Cælestiall Phenomena. Enginry againe of them, and some Propositions *de Cochleâ et Veste*. And so certainly as the number of Axioms concerning severall subjects doth encrease by this work, so the Number of (their Applications to pure Mathematicks, *id est*,) New Mathematicall Arts, will encrease also.

Divines having so large a Booke of Gods works added to that of his word, may the more cleerely from them both, deduce the wisdome, power and goodnesse of the Almighty.

Physicians observing the use of all Drugs and Operations in the production of Artificials, may with successe transferre them to better Vses in their Art.

And Lawyers when they plead concerning Trades and Manufactures, would better Know what to say on such Occasions.

A young beginner may Know by this Book how much stock is needfull to set him up in his Trade.

Gentlemen falling sometimes Accidentally into Tradesmen and handicrafts company, would Know how to make use of such Occurrences to advantage.

Laſtly , This Hiſtory with the Comments thereupon, and the Indices, Preface and Supplements thereunto belonging would make uſable (if it be at all poſſible) to demonſtrate Axioms in Philoſophy, the Value and dignity whereof cannot be valued or computed.

The next Booke which we recommend is the Hiſtory of Nature free, for indeed the Hiſtory of Trades is alſo an Hiſtory of Nature, but of Nature vexed and diſturbed. What we meane by this Hiſtory, may be known by the Lord *Verulam*s moſt excellent Specimen thereof, and as for the particulars that it ſhould treat on, we referre to his Exact and Judicious Catalogue of them, at the end of his Advancement of Learning.

FINIS.
